CLAIMS

What is claimed is:

1. A quantum dot infrared photodetector focal plane array (QDIP FPA) for generating infrared images, the device comprising:

a first contact layer having a metal contact on its surface;

a first barrier layer on the surface of the first contact layer having the metal contact;

a doped quantum dot layer on the first barrier layer, the doped quantum dot layer configured with a plurality of quantum dots, each dot having a size that is sensitive to a first color;

a second barrier layer on the doped quantum dot layer;

a second contact layer on the second barrier layer, the second contact layer having a metal contact on its surface; and

a read-out circuit that is electrically coupled to each of the metal contacts and adapted to correlate electrical signals produced by the doped quantum dot layer to intensity of sensed light, thereby allowing for the generation of infrared images.

2. The device of claim 1 wherein the first contact layer is on an etch stop layer, which is on a substrate that is transparent to infrared light.

3. The device of claim 1 wherein the first contact layer is on an etch stop layer grown on a substrate layer which was subsequently removed, thereby improving imaging capability of the device.

4. The device of claim 1 wherein the first barrier layer, the doped quantum dot layer, and the second barrier layer are repeated a number of times prior to adding the second contact layer.

5. The device of claim 1 wherein the layers of the device are formed on a substrate that is subsequently removed to enable improved imaging capability, and the

metal contacts are adapted to a common planar surface, thereby enabling bump-bonding to the read-out circuit.

6. The device of claim 1 wherein the layers of the device are formed, and the metal contacts are adapted to a common planar surface, thereby enabling bump-bonding to the read-out circuit.

7. The device of claim 1 wherein the device is fabricated using both epi-growth processing and bump-bonding.

8. The device of claim 1 wherein the first contact layer has a second surface opposite the surface having its metal contact, and the device further comprises:

a third contact layer having a metal contact on its surface;

a third barrier layer on the surface of the third contact layer having the metal contact;

a second doped quantum dot layer on the third barrier layer, the second doped quantum dot layer configured with a plurality of quantum dots, each dot having a size that is sensitive to a second color; and

a fourth barrier layer between the second doped quantum dot layer and the second surface of the first contact layer.

9. A quantum dot infrared photodetector focal plane array (QDIP FPA) for generating infrared images, the device comprising:

a first stack of quantum dot epi growths sensitive to a first color;

a second stack of quantum dot epi growths sensitive to a second color; and

a read-out circuit that is adapted to correlate electrical signals produced by the each of the quantum dot epi growths to intensity of sensed light, thereby allowing for the generation of infrared images.

10. The device of claim 9 wherein the first and second quantum dot epi growths are part of a structure formed separately from the read-out circuit, the structure grown on a substrate that was subsequently removed to enable improved imaging capability.

11. The device of claim 9 wherein the first and second quantum dot epi growths are part of a structure formed separately from the read-out circuit, wherein the structure is bump-bonded to the read-out circuit.

12. The device of claim 9 further comprising N additional quantum dot epi growths, with each additional quantum dot growth adapted to sense a unique color, and to provide its output to the read-out circuit.

13. The device of claim 9 wherein the QDIP FPA has an array common, and the first quantum dot epi growth is positively biased with respect to the array common, and the second quantum dot epi growth is negatively biased with respect to the array common

14. A method of manufacturing a quantum dot infrared photodetector focal plane array (QDIP FPA) device for generating infrared images, the method comprising:

growing a first contact layer;

growing a first barrier layer on the first contact layer;

growing a doped quantum dot layer on the first barrier layer, the doped quantum dot layer configured with a plurality of quantum dots, each dot having a size that is sensitive to a first color;

growing a second barrier layer on the doped quantum dot layer;

growing a second contact layer on the second barrier layer; and

bump-bonding a read-out circuit to the grown structure, so as to enable electrical signals produced by the doped quantum dot layer to be correlated to intensity of sensed light, thereby allowing for the generation of infrared images.

15. The method of claim 14 further comprising:

growing an etch stop layer on a substrate that is transparent to infrared light, wherein the first contact layer is grown on the etch stop layer.

16. The method of claim 14 further comprising:

growing an etch stop layer on a substrate, wherein the first contact layer is grown on the etch stop layer; and

after bump-bonding the grown structure to the read-out circuit, removing the substrate.

17. The method of claim 14 further comprising:

repeating the growing of the first barrier layer, the doped quantum dot layer, and the second barrier layer a number of times prior to growing the second contact layer.

18. The method of claim 14 wherein the layers of the device are grown on a substrate, the method further comprising:

removing the substrate to enable improved imaging capability.

19. The method of claim 14 further comprising:

adapting metal contacts of the contact layers to a common planar surface.

20. The method of claim 14 wherein prior to growing the first contact layer, the method further comprises:

growing a third contact layer;

growing a third barrier layer on the third contact layer;

growing a second doped quantum dot layer on the third barrier layer, the second doped quantum dot layer configured with a plurality of quantum dots, each dot having a size that is sensitive to a second color; and

growing a fourth barrier layer between the second doped quantum dot layer and the second surface of the first contact layer.